REMARKS/ARGUMENTS

In response to the Office Action mailed October 26, 2005, Applicants propose to amend their application and request reconsideration in view of the proposed amendments the following remarks. No claims are proposed to be added or cancelled in this Amendment so that upon entry of the Amendment claims 1-3 and 6-9 will remain pending.

In this Amendment claims 7 and 8 are rewritten in independent form without any change whatsoever. No claims are amended. Since the rewriting of claims 7 and 8 in independent form only presents the same claims previously examined, this Amendment cannot introduce any new issue that requires further deliberation or search. Accordingly, even if the Examiner determines to maintain some or all of the previous rejections, the Amendment should be entered for purposes of appeal.

Claims 1 and 8 were rejected a unpatentable over Abe et al. (U.S. Patent 5,020,072, hereinafter Abe) in view of Lo (U.S. Patent 5,617,436), and further in view of Sato (U.S. Patent 6,175,581). This rejection is respectfully traversed.

No matter what attempt to splice Abe, Sato, and Lo together, no suggestion can be found for the invention as defined by claims 1 and 8. With respect to both claims, the semiconductor laser includes opposed first and second end surfaces through which light generated in the semiconductor laser may be emitted. While Abe and Sato include such end surfaces, it is apparent that Lo describes a surface emitting laser in which the light generated within the laser is radiated in a direction perpendicular to a line joining the first and second end surfaces. Further, the claimed semiconductor laser includes a central phase shift structure located substantially centrally between the first and second end surfaces. Applicants agree that each of the three references describes semiconductor lasers including central phase-shift structures.

The semiconductor laser according to claim 1 includes first and second diffraction gratings *respectively extending from the central phase-shift region to the first and second end faces* and having respective different periods. None of the three patents applied combination in rejecting claims 1 and 8 discloses such a structure. In Abe, all of the illustrated and described semiconductor laser structures are symmetrical about the central

phase-shift structure and none include respective diffraction gratings extending from the central phase-shift structure to the end surfaces and having different periods.

Lo describes a complex semiconductor laser structure including a central phase-shift structure and respective pairs of diffraction gratings on each side of the central phase shift structure. All of the Lo diffraction grating structures are symmetrical and none of those semiconductor lasers includes diffraction gratings with different periods on opposite sides of the central phase-shift structure. To be sure, on each side of the central phase-shift structure there are two diffraction gratings with different periods, a first order diffraction grating and a second order diffraction grating. These are not the gratings of claim 1 because they do not have "respective" periods and do not extend to the end surfaces. Even in combination, each pair of diffraction gratings does not extend from the central phase-shift structure to respective end surfaces. Instead, the compound diffraction gratings stop well short of the end surfaces, at the transparent electrodes 34, as shown in all figures of Lo.

Sato describes still more complicated semiconductor laser structures some of which include a central phase-shift element. On opposite sides of the phase-shift element there are either respective single diffraction gratings with different periods, as in Figure 3(A) of Sato, or pairs of different period diffraction gratings as in Figures 1(A) and 2(A) of Sato. As to the structure of Figure 3(A) of Sato, clearly there are no diffraction gratings extending to the first and second end surfaces. As to the structures of Figures 1(A) and 2(A) of Sato, there are no first and second diffraction gratings with respective different periods that extend from the central phase-shift structure to the respective first and second end faces. Rather, much more complex structures are described and illustrated in those figures. Accordingly, because the respective diffraction gratings with different periods extending to the end surfaces, as defined by claims 1 and 8, are missing from all three publications, *prima facie* obviousness cannot be established by any potential combination of those three publications as to those two claims.

Claim 8 further specifies a structure for achieving the different coupling coefficients on opposite sides of the central phase shift structure. In that structure, a layer supporting the first and second diffraction gratings has a smaller thickness in the region of

the semiconductor laser with the larger coupling coefficient. According to the Official Action at page 4, this structure is taught in the prior art in Figure 7, column 11, lines 49-57. While the reference relied upon for that teaching is not identified in that passage of the Official Action, it would appear that the Examiner is relying upon Abe. In the cited passage of Abe, different coupling coefficients in different regions of a symmetrical semiconductor laser are produced by employing different thicknesses of a layer. However, the teaching in Abe does not match the limitation of claim 8.

Claim 8 refers to the thickness of a layer supporting the diffraction grating whereas, in Abe, the layer of interest that has a varying thickness in different parts of the semiconductor laser does not support the diffraction grating. That layer is part of the diffraction grating. Further, according to the cited passage of Abe, the coupling coefficient in the region I of Figure 6(b) of Abe where the thickness of the layer of interest is larger, is larger than the coupling coefficient in the region II where the thickness of the layer of interest is smaller. Assuming, for the sake of argument, that the layer in Abe corresponds to the layer in claim 8, it can be seen that the result achieved by Abe is exactly the opposite of the structure of claim 8. In the structure of claim 8, the supporting layer is thinner in the region having the larger coupling coefficient, just the opposite of what is described in Abe. Clearly, *prima facie* obviousness has not been established with regard to claim 8.

Claim 2 was rejected on the same grounds as claim 1, i.e., in view of the combination of Abe, Lo, and Sato, and further in view of a publication by Lu et al. According to the rejection, Lu supplies the limitation of claim 2 in a way that would make addition of that limitation to claim 1 obvious. The rejection is traversed on two independent grounds. First, as already described, Abe, Lo, and Sato do not establish *prima facie* obviousness of claim 1, the predicate of the rejection of claim 2. Second Lu does not supply the limitation of claim 2.

Claim 2 specifies that the absolute value of a real part of the coupling coefficient is at least four times the absolute value of the imaginary part of the coupling coefficient. Applicants agree that the cited passage of Lu describes that coupling coefficients have both a real part and an imaginary part. Further, Figure 3 of Lu is a graph of a ratio of

imaginary part to real part of the coupling coefficient for some hypothetical lasers. While some points on the graph are below 0.25, presumptively within the range of claim 2, what is really shown in Lu is a dependency of resonator length on the two components of the coupling coefficient as a function of the number of layers of quantum wells of the active layer. Thus, Lu does not suggest a modification of the structure of claim 1 in which different coupling coefficients are achieved in different regions of the semiconductor laser. Rather, Lu only concerns considerations that apply with regard to an entirely symmetrical semiconductor laser. For that reason, Applicants submit that Lu does not suggest the invention as defined by claim 2.

Dependent claims 3, 6, and 9 were rejected over the combination of Abe, Lo, and Sato in view of respective further references. As to these claims, Applicants traverse the rejections on the grounds that the additionally cited references are only asserted to teach the limitations of the respective dependent claims. Since, for the reasons already provided, the combination of Abe, Lo, and Sato does not suggest the invention of claim 1, the further combinations cannot suggest the invention as defined by claims 3, 6, and 9.

Claim 7 was rejected as unpatentable over Abe, Lo, and Sato, and further in view of Takiguchi. This rejection is respectfully traversed.

Claim 7, presented in independent form, describes the diffraction gratings as including layered structures. Further, claim 7 specifies that the *number* of layers of the higher refractive index region in the first diffraction grating is larger than the number of the corresponding layers in the second diffraction grating. This claim encompasses the embodiment of the invention illustrated in Figure 6 of the patent application. It can be seen that in figure that the number of layers in the higher refractive portion of the first diffraction grating, illustrated for convenience as three layers, is larger in number than the corresponding number of layers in the second diffraction grating, i.e., two layers.

In the rejection, the Examiner asserted that Takiguchi teaches that changing both the refractive index and the thickness of grating layers will change the coupling coefficient so that it would have been obvious to vary the thickness and refractive index of the gratings, apparently meaning grating layers, to produce the claimed invention. Since that assertion based on the Takiguchi disclosure is not commensurate with the

description of claim 8, the Examiner further asserted at page 7 of the Office Action that this teaching would have made it obvious to add additional layers of material as in the structure of claim 7. Applicants respectfully disagree. Clearly, thickening a layer or changing its composition is not the same as depositing layers of different compositions in different regions and depositing different numbers of those layers in different regions in the course of manufacturing the semiconductor laser. Takiguchi has simply been interpreted beyond its disclosure, based on the invention claimed, a prohibited basis for establishing obviousness of a claimed invention. The rejection of claim 7 is plainly erroneous and, upon reconsideration, should be withdrawn.

Reconsideration and allowance of all pending claims are earnestly solicited.

Respectfully submitted,

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